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# **MACHINE FOR COLLECTING CORN EARWORM PUPAE**

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# MACHINE FOR COLLECTING CORN EARWORM PUPAE

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Collecting pupae with little or no injury is a problem in large-scale rearing of the corn earworm, *Heliothis zea* (Boddie). A machine has been developed to collect pupae reared at the Southern Grain Insects Research Laboratory, Tifton, Ga., in a plastic web 15.2 centimeters wide by 111.8 centimeters long, containing 128 rearing cells in a 4 by 32 pattern (fig. 1). The web is formed, filled with diet<sup>2</sup> (5–10 milliliters), infested with eggs, covered, and cut into desired lengths (111.8 centimeters) in a continuous operation. The webs are stacked on a cart and placed in an environmental room until the pupae are ready to collect.

The pupae collector (fig. 2) consists essentially of a pair of squeeze rollers, inverting rollers, wire conveyor, solid conveyor, collecting tray, and receptacles for holding pupae and trash. The collector is 50.8 centimeters wide by 76.2 centimeters long by 142.2 centimeters high. The operator manually lifts a corner of the cover (Tyvek), which is heat-sealed to the upper surface of the web, and slides the web onto a rack. The cover is picked up by the squeeze

rollers (2.54 centimeters in diameter) and stripped from the web. The inverting rollers (30.5 centimeters in diameter), pressing against the outer edge of the web, pull the web into the machine. This positions the cells so that the pupae and the trash can be either washed from or fall from the cells onto a wire conveyor. The wire conveyor (27.9 centimeters wide) is made of 12.7-millimeter by 5.1-centimeter mesh wire, 1.3 millimeters in diameter. Pupae and small trash fall through the wire conveyor

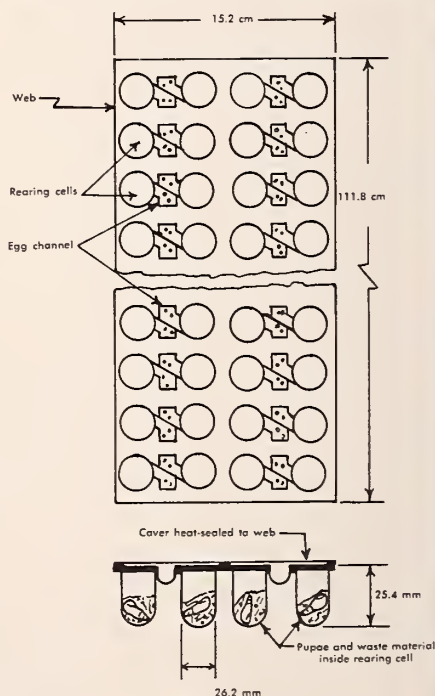


FIGURE 1.—Schematic of plastic web used to rear insects at the Southern Grain Insects Research Laboratory, Tifton, Ga.

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<sup>2</sup> Burton, R. L. A low-cost artificial diet for the corn earworm. J. Econ. Entomol. 63(6): 1969–70. 1970.

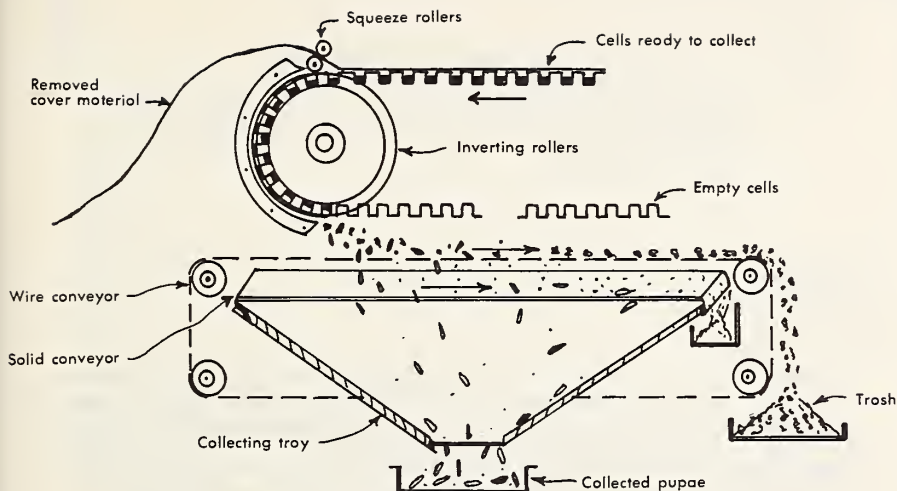


FIGURE 2.—Corn earworm pupae collecting machine.

onto a solid conveyor positioned at an angle of about  $17^\circ$  from the horizontal, while the empty cells and the large trash are conveyed from the machine. Pupae roll from the side of the solid conveyor into a collecting tray without abruptly changing directions and then into a receptacle. The receptacle is a biodegradable meat packaging tray 25.4 by 20.2 by 2.5 centimeters deep. The collecting tray is made of 3.2-millimeter mesh wire to further separate the pupae from the trash. Both conveyors move waste materials from the collector.

Collector components are positioned in relation to each other to minimize rough handling of the pupae. When the rearing cells are inverted, they are resting on the wire conveyor. Pupae falling from the cells pass through the wire conveyor and land on the solid conveyor (two-ply rubber), which has edges 2.0 and 8.5 centimeters below the wire conveyor. The av-

erage distance of pupal fall is approximately 4.3 centimeters.

The efficiency of the collector depends upon the condition of the waste material (spent diet, webbing, and insect excretion), which in turn is governed by the temperature and the humidities used for rearing the insects in the individual rearing cells. The waste material must be dry so that it and the pupae fall easily from the cells. Pupae are collected at this laboratory 21 days after the cells are processed and held in an environment of about 60 to 70 percent relative humidity and  $85^\circ$  F. The machine, with one operator, has the capacity for collecting pupae from 20,000 to 25,000 cells per hour with little, if any, injury. Additional work is needed to further clean the pupae mechanically and thus make this machine more satisfactory.

Additional information on this equipment may be obtained from the authors.

## ACKNOWLEDGMENT

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